

**Thursday 15 May 2014 – Morning**

**GCSE TWENTY FIRST CENTURY SCIENCE  
CHEMISTRY A/SCIENCE A**

**A171/01** Modules C1 C2 C3 (Foundation Tier)

Candidates answer on the Question Paper.  
A calculator may be used for this paper.

**OCR supplied materials:**  
None

**Other materials required:**

- Pencil
- Ruler (cm/mm)

**Duration:** 1 hour



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The quality of written communication is assessed in questions marked with a pencil (✎).
- The Periodic Table is printed on the back page.
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- This document consists of **24** pages. Any blank pages are indicated.

Answer **all** the questions.

1 This question is about fuels that burn in car engines.

These fuels are hydrocarbons.

(a) (i) Hydrocarbons burn in plenty of air to make two products.

One product is carbon dioxide.

What is the **other** product?

Put a **ring** around the correct answer.

**chlorine**

**nitrogen**

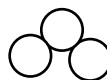
**oxygen**

**water**

[1]

(ii) Which diagram shows a molecule of carbon dioxide,  $\text{CO}_2$ ?

Put a **ring** around the correct answer.



[1]

(b) Dom and Kate live in a town that has bus lanes.

**Only** buses can drive in bus lanes.

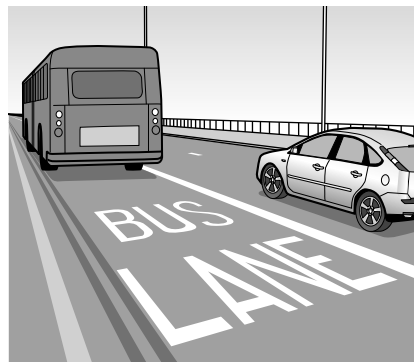
This means that at busy times buses travel faster than cars.

Buses and cars make carbon dioxide and other pollutants when they burn fuel.

Dom says there will be **less** air pollution as more people will travel by bus.

Kate says there will be **more** air pollution as a bus burns more fuel than a car.

Who is correct and why?



*The quality of written communication will be assessed in your answer.*

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[6]

[Total: 8]

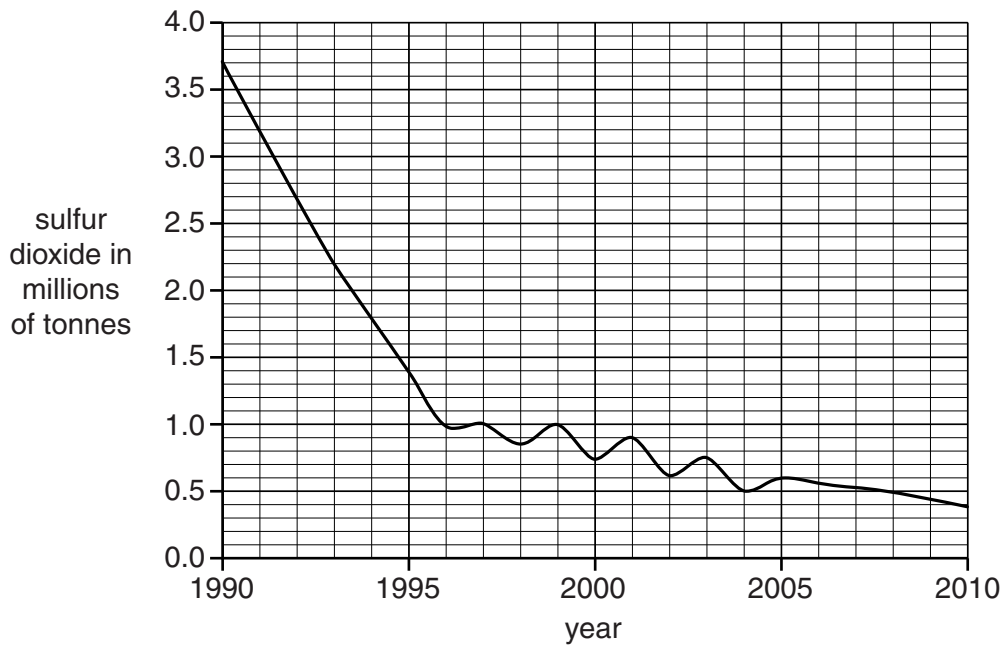
2 Sulfur dioxide is a pollutant from coal-fired power stations.

(a) Sulfur dioxide is made from two elements.

Name these elements and say where they come from in a coal-fired power station.

.....  
.....  
.....  
..... [2]

(b) The graph shows the amount of sulfur dioxide put into the air from 1990 to 2010.



Write **three** things that this graph shows about the amount of sulfur dioxide put into the air.

.....  
.....  
.....  
.....  
..... [3]

(c) (i) Jake is a scientist.

Jake says, "Sulfur dioxide pollution has decreased as coal-fired power stations have shut down."

This statement is an example of

- a correlation                  an estimation                  an evaluation                  a prediction**

Put a ring around the correct answer. [1]

(ii) Shutting down coal-fired power stations is one way to lower the amount of sulfur dioxide put into the air.

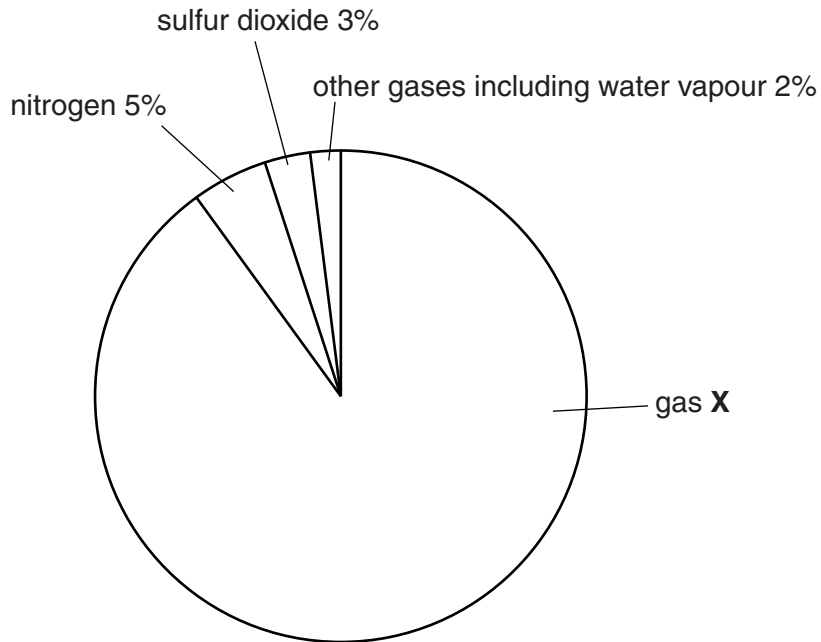
Describe and explain **another** way.

.....  
.....  
.....  
..... [2]

[Total: 8]

- 3 Scientists have estimated the percentage of different gases in the atmosphere before plant life on Earth began.

The pie chart shows this estimation.



- (a) What is the gas X that made up most of the atmosphere before there was life on Earth?

Put a ring around the correct answer.

**argon**                      **carbon dioxide**                      **nitrogen oxide**                      **oxygen**                      [1]

- (b) Explain why the composition of the Earth's atmosphere changed after plant life on Earth began.

.....

.....

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..... [2]

[Total: 3]

4 A supermarket uses plastic carrier bags.



The handles of some of a **new** set of bags break when customers carry their shopping away.

The supermarket complains to the company that makes the bags.

The company tests 5 of the new set of bags.

They find the mass that will break each bag.

Here are their measurements.

Bag number	1	2	3	4	5
Mass to break handle in kg	6.5	8.2	6.1	10.2	9.0

(a) (i) Use **all** their measurements to find the mean value of the mass to break the handles.

Show your working.

..... kg [2]

(ii) What is the range of these measurements?

..... to ..... kg [1]

(iii) Measurements on older bags have the same mean value.

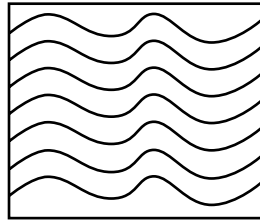
The range for the older bags is 7.4 to 8.6 kg.

Use this information and your answer to part (ii) to suggest why some of the new bags are breaking more easily than the old ones.

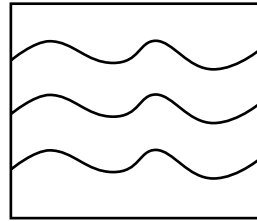
.....  
 ..... [1]

(b) Carrier bags are made of polythene.

The diagrams show how the molecules are arranged in two types of polythene.



polythene **A**



polythene **B**

(i) Put a tick (✓) in the box next to the correct words to complete the sentence.

The density of polythene <b>A</b> is	higher than	<input type="checkbox"/>	the density of polythene <b>B</b> .
	lower than	<input type="checkbox"/>	
	the same as	<input type="checkbox"/>	

[1]

(ii) Molecules that are **closer** together have **bigger** forces between them.

Put a tick(✓) in the box next to the correct words to complete the sentence.

The breaking strength of polythene <b>A</b> is	higher than	<input type="checkbox"/>	the breaking strength of polythene <b>B</b> .
	lower than	<input type="checkbox"/>	
	the same as	<input type="checkbox"/>	

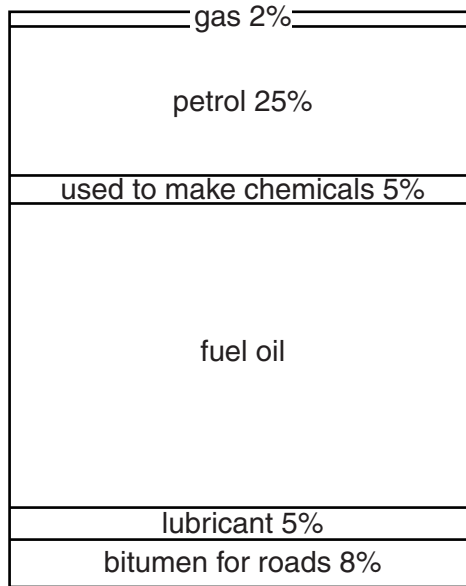
[1]

[Total: 6]



5 An oil refinery separates crude oil into different fractions.

This diagram shows the amount of each fraction made from a barrel of crude oil.



(a) (i) Here are some statements about the fractions in crude oil.

Use the diagram to find out if the statements are true or false.

Put a tick (✓) in the correct box for each statement.

	true	false
The smallest fraction of crude oil is gas.		
There is more lubricant than petrol.		
The amount of crude oil used to make chemicals is the same as the amount of lubricant.		

[2]

(ii) Show that more than half of the crude oil is used as fuel oil.

.....

..... [2]

(b) Complete the sentences to explain why gas boils at a lower temperature than fuel oil.

Put a tick (✓) in the box next to the correct words to complete the sentences.

Gas molecules are	smaller than	<input type="checkbox"/>	molecules of fuel oil.
	the same size as	<input type="checkbox"/>	
	larger than	<input type="checkbox"/>	

The forces between gas molecules are	smaller than	<input type="checkbox"/>	the forces between molecules of fuel oil.
	the same size as	<input type="checkbox"/>	
	larger than	<input type="checkbox"/>	

The energy needed to overcome the forces between gas molecules is	less than	<input type="checkbox"/>	the energy needed to overcome the forces between molecules of fuel oil.
	the same as	<input type="checkbox"/>	
	more than	<input type="checkbox"/>	

[2]

[Total: 6]

11  
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**Question 6 begins on page 12**  
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(b) Give **one** other use of nanoparticles and say how nanoparticles improve the properties.

.....

.....

.....

..... [2]

[Total: 8]

7 Some people are talking about the Government's advice on eating salt.

This is what they say.

**Dr Abbott**  
Salt has been used as a preservative for centuries. My company makes foods that use salt in this way. Sickness from food poisoning is much more common than high blood pressure.

**Mr Collins**  
Government scientists set a target to eat less than 6 g per day of salt. I eat 0 g per day because I never put salt on my food.

**Miss Brown**  
A great deal of evidence that eating less salt lowers blood pressure has been published in scientific journals.

**Mrs Evans**  
I look on packet labels and try to keep my salt intake as low as possible.

**Professor Derry**  
I went to a conference where scientists showed evidence that a low sodium diet could be harmful to some people.

(a) (i) Who is talking about information that has been **peer reviewed**?

Put ticks (✓) in the boxes next to the **two** correct answers.

- Dr Abbott
- Miss Brown
- Mr Collins
- Professor Derry
- Mrs Evans

[1]

(ii) Who is saying that a benefit of salt in food, outweighs a risk from eating too much salt?

Put a tick (✓) in the box next to the correct answer.

Dr Abbott

Miss Brown

Mr Collins

Professor Derry

Mrs Evans

[1]

(iii) Mr Collins and Mrs Evans have different ways of assessing the amount of salt they eat.

Who is correct and why?

.....  
.....  
.....  
..... [2]

(iv) Companies add salt to foods to preserve them and for one other reason.

What is that other reason?

..... [1]

(b) (i) People with high blood pressure can use potassium chloride as a substitute for salt (sodium chloride).

Rocks containing potassium chloride are found deep underground and mined in the same ways as those containing sodium chloride.

Companies make potassium chloride using solution mining.

Suggest reasons why they might use solution mining rather than digging rocks out of the ground.

.....  
.....  
.....  
..... [2]

(ii) Potassium chloride solution is electrolysed to make different products.

It is similar to the electrolysis of sodium chloride.

Hydrogen, chlorine and one other product are made.

What is the other product?

Put a **ring** around the correct answer.

**potassium  
carbonate**

**potassium  
hydroxide**

**potassium  
oxide**

**sodium  
chloride**

[1]

[Total: 8]



17  
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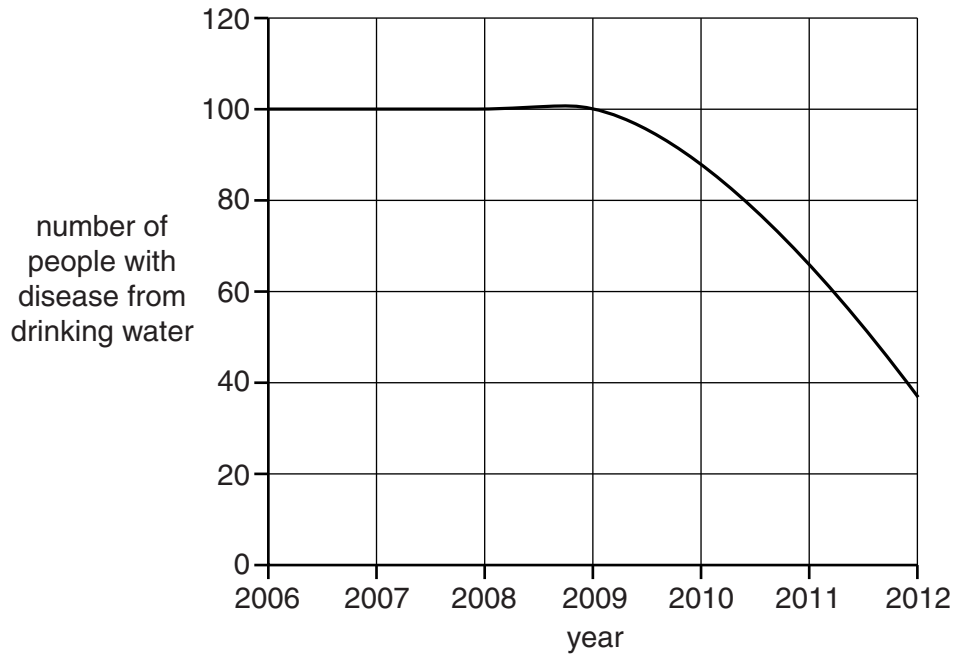
**Question 8 begins on page 18**  
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8 In remote parts of a developing country, the drinking water causes diseases that kill people.

In one area people started to add chlorine to drinking water from 2009.

A charity raised the money to pay for this.

Look at the graph.



Should chlorine be added to drinking water in other remote areas?

In your answer you should:

- describe what the graph shows you about adding chlorine
- explain why the chlorine has an effect
- write about the advantages and disadvantages of adding chlorine to drinking water in other parts of the developing country.



*The quality of written communication will be assessed in your answer.*

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[6]

[Total: 6]

9 This is a question about poly vinyl chloride (PVC).

(a) PVC contains carbon, hydrogen and one other type of atom.

What is the other type of atom?

Put a **ring** around the correct answer.

**chlorine**

**nitrogen**

**sodium**

**sulfur**

[1]

(b) PVC is used to make window frames and bags for blood transfusions.

Life Cycle Assessments (LCA) for these two uses are different.

Which **two** statements about LCAs explain this difference?

Put ticks (✓) in the boxes next to the **two** correct answers.

Crude oil is used to make the PVC.

Energy is used to make PVC from crude oil.

There is an environmental impact when PVC is made from crude oil.

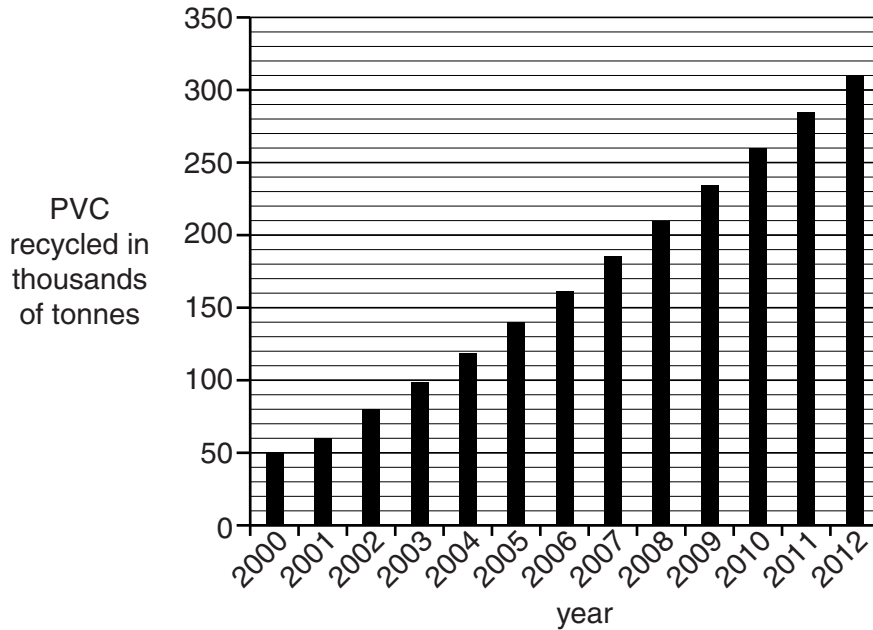
There is an environmental impact when each product is made from PVC.

The length of time each product is in use.

[2]

(c) PVC can be disposed of in landfill or recycled.

The graph shows the amount of PVC recycled in Europe since the year 2000.



(i) The European target was to recycle 200 000 more tonnes of PVC in 2010 than in 2000.

Was this target reached?

Explain your answer.

.....

.....

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..... [2]

(ii) Suggest **two** advantages of recycling **more** PVC.

.....

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..... [2]

[Total: 7]

END OF QUESTION PAPER

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# The Periodic Table of the Elements

	1	2	3	4	5	6	7	0									
	7 <b>Li</b> lithium 3	9 <b>Be</b> beryllium 4	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">                     1 <b>H</b> hydrogen 1                 </div>					11 <b>B</b> boron 5	12 <b>C</b> carbon 6	14 <b>N</b> nitrogen 7	16 <b>O</b> oxygen 8	19 <b>F</b> fluorine 9	20 <b>Ne</b> neon 10				
	23 <b>Na</b> sodium 11	24 <b>Mg</b> magnesium 12	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">                     relative atomic mass atomic symbol name atomic (proton) number                 </div>					27 <b>Al</b> aluminium 13	28 <b>Si</b> silicon 14	31 <b>P</b> phosphorus 15	32 <b>S</b> sulfur 16	35.5 <b>Cl</b> chlorine 17	40 <b>Ar</b> argon 18				
	39 <b>K</b> potassium 19	40 <b>Ca</b> calcium 20	45 <b>Sc</b> scandium 21	48 <b>Ti</b> titanium 22	51 <b>V</b> vanadium 23	52 <b>Cr</b> chromium 24	55 <b>Mn</b> manganese 25	56 <b>Fe</b> iron 26	59 <b>Co</b> cobalt 27	59 <b>Ni</b> nickel 28	63.5 <b>Cu</b> copper 29	70 <b>Ga</b> gallium 31	73 <b>Ge</b> germanium 32	75 <b>As</b> arsenic 33	79 <b>Se</b> selenium 34	80 <b>Br</b> bromine 35	84 <b>Kr</b> krypton 36
	85 <b>Rb</b> rubidium 37	88 <b>Sr</b> strontium 38	89 <b>Y</b> yttrium 39	91 <b>Zr</b> zirconium 40	93 <b>Nb</b> niobium 41	96 <b>Mo</b> molybdenum 42	[98] <b>Tc</b> technetium 43	101 <b>Ru</b> ruthenium 44	103 <b>Rh</b> rhodium 45	106 <b>Pd</b> palladium 46	108 <b>Ag</b> silver 47	112 <b>Cd</b> cadmium 48	115 <b>In</b> indium 49	119 <b>Sn</b> tin 50	122 <b>Sb</b> antimony 51	127 <b>I</b> iodine 53	131 <b>Xe</b> xenon 54
	133 <b>Cs</b> caesium 55	137 <b>Ba</b> barium 56	139 <b>La*</b> lanthanum 57	178 <b>Hf</b> hafnium 72	181 <b>Ta</b> tantalum 73	184 <b>W</b> tungsten 74	186 <b>Re</b> rhenium 75	190 <b>Os</b> osmium 76	192 <b>Ir</b> iridium 77	195 <b>Pt</b> platinum 78	197 <b>Au</b> gold 79	201 <b>Hg</b> mercury 80	204 <b>Tl</b> thallium 81	207 <b>Pb</b> lead 82	209 <b>Bi</b> bismuth 83	[210] <b>At</b> astatine 85	[222] <b>Rn</b> radon 86
	[223] <b>Fr</b> francium 87	[226] <b>Ra</b> radium 88	[227] <b>Ac*</b> actinium 89	[261] <b>Rf</b> rutherfordium 104	[262] <b>Db</b> dubnium 105	[266] <b>Sg</b> seaborgium 106	[264] <b>Bh</b> bohrium 107	[277] <b>Hs</b> hassium 108	[268] <b>Mt</b> meitnerium 109	[271] <b>Ds</b> darmstadtium 110	[272] <b>Rg</b> roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated					

\* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.